



[4910-13]

DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 25

[Docket No. FAA-2015-0311; Special Conditions No. 25-592-SC]

Special Conditions: Gulfstream Aerospace Corporation Model GVII-G500

airplanes; Electronic Flight Control System: Control Surface Position Awareness

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final special conditions, request for comments.

SUMMARY: These special conditions are issued for Gulfstream Model GVII-G500 airplanes.

These airplanes have a novel or unusual design feature associated with control-surface awareness provided by the electronic flight-control system. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

DATES: This action is effective on Gulfstream on **[Insert date of publication in the Federal Register]**. We must receive your comments by **[Insert date 45 days after date of publication in the Federal Register]**.

ADDRESSES: Send comments identified by docket number FAA-2015-0311 using any of the following methods:

- *Federal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.
- *Mail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.
- *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.
- *Fax:* Fax comments to Docket Operations at 202-493-2251.

Privacy: The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

Docket: Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

FOR FURTHER INFORMATION CONTACT: Joe Jacobsen, FAA, Airplane and Flightcrew Interface Branch, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601

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SUPPLEMENTARY INFORMATION:

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplanes.

In addition, the substance of these special conditions has been subject to the public comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the **Federal Register**.

Background

On March 29, 2012, Gulfstream applied for a type certificate for their new Model GVII-G500 airplane. This airplane is a large-cabin business jet capable of accommodating up to 19 passengers. It will incorporate a low, swept-wing design with winglets and a T-tail. The powerplant will consist of two aft-fuselage mounted Pratt & Whitney turbofan engines. Avionics will include four primary display units and multiple touchscreen controllers. The flight-control system is a three-axis, fly-by-wire system controlled through active control/coupled side sticks.

The Model GVII-G500 airplane will have a wingspan of approximately 87 ft. and a length of just over 91 ft. Maximum takeoff weight will be approximately 76,850 lbs and maximum takeoff thrust will be approximately 15,135 lbs. Maximum range will be approximately 5,000 nm and maximum operating altitude will be 51,000 ft.

In airplanes with electronic flight-control systems, a direct correspondence between pilot-control position and the associated airplane control-surface position is not always apparent. Under certain circumstances, a commanded maneuver that may not involve a large flightcrew-control input may nevertheless require a large control-surface movement to accomplish, possibly encroaching on a control-surface or actuation-system limit without the flightcrew's knowledge. This situation can arise in both piloted (i.e., manual) and autopilot flight, and may be further intensified on airplanes where the pilot controls are not back-driven during autopilot system operation.

These special conditions for control-surface awareness, applicable to Gulfstream Model GVII-G500 airplanes, require suitable flight-control-position annunciation and control-system mode of operation to be provided to the flightcrew when a flight condition exists in which nearly full surface authority (not crew-commanded) is being utilized. Suitability of such a display must take into account that some pilot-demanded maneuvers (e.g., rapid roll) are necessarily associated with intended full performance, which may saturate the surface. Therefore, simple alerting systems, which would function in both intended or unexpected control-limiting situations, must be properly balanced between needed crew awareness and nuisance features. A monitoring system that might compare airplane motion, surface deflection, and pilot side-stick controller (SSC) demand, could be useful for elimination of nuisance alerting.

Type Certification Basis

Under Title 14, Code of Federal Regulations (14 CFR) 21.17, Gulfstream must show that the Model GVII-G500 airplane meets the applicable provisions of 14 CFR part 25, as amended by Amendments 25-1 through 25-137.

In addition, the certification basis includes certain special conditions, exemptions, or later amended sections of the applicable part that are not relevant to these special conditions.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model GVII-G500 airplane because of a novel or unusual design feature, special conditions are prescribed under § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same or similar novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Gulfstream Model GVII-G500 airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34, and the noise-certification requirements of 14 CFR part 36; and the FAA must issue a finding of regulatory adequacy under § 611 of Public Law 92-574, the “Noise Control Act of 1972.”

The FAA issues special conditions, as defined in 14 CFR 11.19, under § 11.38, and they become part of the type certification basis under § 21.17(a)(2).

Novel or Unusual Design Features

The Gulfstream Model GVII-G500 airplane incorporates the following novel or unusual design features: electronic flight-control system providing control-surface awareness to the flightcrew.

Discussion

Gulfstream Aerospace Corporation is intending to utilize an electronic flight-control system (including side-stick controllers for pitch and roll control) in their new Model GVII-G500

airplane. With an electronic flight-control system and no direct coupling from the flightdeck controller to the control surface, the pilot may not be aware of the actual surface position utilized to fulfill the requested demand. Some unusual flight conditions, arising from atmospheric conditions, airplane malfunctions, or engine failures, may result in full or nearly full control-surface deflection. Unless the flightcrew is made aware of excessive deflection or impending control-surface limiting, piloted or auto-flight system control of the airplane might be inadvertently continued in such a manner as to cause loss of airplane control, or other unsafe stability or performance characteristics.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

Applicability

As discussed above, these special conditions apply to Gulfstream Model GVII-G500 airplanes. Should Gulfstream apply later for a change to the type certificate to include another model incorporating the same or similar novel or unusual design feature, these special conditions would apply to that model as well.

Conclusion

This action affects only certain novel or unusual design features on Gulfstream Model GVII-G500 airplanes. It is not a rule of general applicability.

List of Subjects in 14 CFR Part 25

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

The Special Conditions

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Gulfstream Model GVII-G500 airplanes.

In addition to the requirements of §§ 25.143, 25.671, 25.672, and 25.1322, when a flight condition exists where, without being commanded by the crew, control surfaces are coming so close to their limits that return to the normal flight envelope, or continuation of safe flight, or both, requires a specific crew action, a suitable flight-control-position annunciation must be provided to the crew, unless other existing indications are found adequate or sufficient to prompt that action.

NOTE: The term “suitable” indicates an appropriate balance between necessary operation and nuisance factors.

Issued in Renton, Washington, on August 7, 2015.

Michael Kaszycki
Acting Manager, Transport Airplane Directorate
Aircraft Certification Service
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